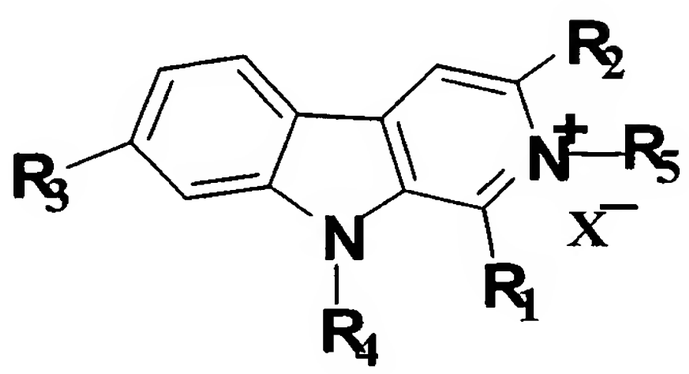
IN THE CLAIMS

1. A compound of the following formula (I)



wherein

R_1 is selected from the group consisting of hydrogen, linear or branched C_{1-6} alkyl, C_{6-10} arylalkyl, mono- or multi-substituted C_{6-10} arylalkyl, heterocyclic group and alkenyl, wherein the substituents are defined to be halogen, C_{1-4} linear or branched alkyl, C_{1-4} linear or branched alkoxy, nitro, amino, hydroxyl and carboxyl;

R_2 is selected from the group consisting of hydrogen, carboxyl, ester group, carboxylate, acylamino, acyl halide group, linear or branched C_{1-6} alkoxycarbonyl, C_{6-10} arylalkoxycarbonyl, mono- or multi- C_{6-10} arylalkoxycarbonyl, and or heterocyclic oxycarbonyl, wherein the substituents are defined as above;

R_3 is selected from the group consisting of hydrogen, hydroxyl, linear or branched C_{1-6} alkoxy, carboxylic esters, carboxylic salts, C_{6-10} arylalkoxy, and heterocyclic oxy group;

R_4 is selected from the group consisting of hydrogen, linear or branched C_{1-6} alkyl, hydroxyl- linear or branched C_{1-6} alkyl, C_{6-10} arylalkyl, mono- or multi-substituted C_{6-10} arylalkyl, and heterocyclic group, wherein the substituents are defined as above;

R_5 is selected from the group consisting of hydrogen, C_{1-6} linear or branched alkyl, C_{6-10} arylalkyl, mono- or multi-substituted C_{6-10} arylalkyl, wherein the substituents are defined as above;

X is selected from the group consisting of pharmacologically acceptable organic or inorganic acid radical, wherein the organic acids include Lewis acid,

or R_5 and X do not co-exist; and

R_1, R_2, R_3, R_4 and R_5 do not represent hydrogen at the same time, and

when R_2, R_4 and R_5 are hydrogen, R_1 does not represent methyl and R_3 does not represent methoxy;

when R_1 is methyl, R_2, R_3, R_4 and R_5 do not represent hydrogen at the same time;

when R_1 is methyl, R_2 and R_5 are hydrogen, and R_3 is methoxy, R_4 is not methyl, ethyl or butyl;

when R_1, R_3 R_4 and R_5 are hydrogen, R_2 is not C_{1-4} linear or branched alkoxycarbonyl;

when R_1 is methyl, R_2 is hydrogen, and R_3 is linear or branched alkoxy, R_4 and R_5 do not represent hydrogen at the same time,

when R_1, R_3 and R_4 are hydrogen, R_2 is ethoxycarbonyl and X is trifluoromethylsilyl, R_5 is not *n*-propyl, allyl, or ortho-, meta-, or *p*-fluorobenzyl; and at the same time

the following compounds are excluded:

Ethyl 1-methyl-β-carboline-3-carboxylate,

Methyl-1-phenyl-β-carboline-3-carboxylate,

Methyl 1-(4-methoxy) phenyl-β-carboline-3-carboxylate,

β-Carboline-3-carboxylic acid,

3-Hydroxymethyl-β-carboline,

3-Amino-β-carboline,

3-[(Methoxycarbonyl)amino]- β-carboline,

3-[(Ethoxycarbonyl)amino]-β-carboline,
Ethyl 9-methyl-β-carboline-3-carboxylate,

Ethyl 1,9-dimethyl-β-carboline-3-carboxylate,

Ethyl 9-benzyl-1-methyl-β-carboline-3-carboxylate, and

9-Methyl-β-carboline.

2. The compound according to claim 1, characterized in that R_1 is selected from the group consisting of hydrogen, C_{1-6} linear or branched alkyl, C_{6-10} aryl-C_{0-6} linear or branched alkyl, mono- or multi-substituted C_{6-10} aryl-C_{0-6} linear or branched alkyl.

3. The compound according to claim 2, characterized in that R_1 is selected from the group consisting of hydrogen, C_{1-4} linear or branched alkyl, C_{6-10} aryl-C_{0-4} linear or branched alkyl, mono- or multi-substituted C_{6-10} aryl-C_{0-4} linear or branched alkyl.

4. The compound according to claim 3, characterized in that R_1 is selected from the group consisting of hydrogen, C_{1-2} alkyl, phenyl-C_{0-4} linear or branched alkyl, mono- or multi-substituted phenyl-C_{0-4} linear or branched alkyl.

5. The compound according to claim 4, characterized in that R_1 is selected from hydrogen, methyl, phenyl, and mono- or multi-substituted phenyl.

6. (Canceled)

7. The compound according to claim 5, characterized in that R_1 is hydrogen.

8. The compound according to claim 5, characterized in that R_1 is methyl.

9. The compound according to claim 1, characterized in that R_2 is selected from the group consisting of hydrogen, carboxylic acid, carboxylic metal salts, C_{1-6} linear or branched alkoxycarbonyl, C_{6-10} aryl-C_{1-6} linear or branched alkoxycarbonyl, mono- or multi- C_{6-10} aryl-C_{1-6} linear or branched alkoxycarbonyl, and when R_2 is a carboxylic metal salt, R_5 and X are not present simultaneously.

10. The compound according to claim 9, characterized in that R_2 is selected from the group consisting of hydrogen, carboxylic acid, carboxylic metal salts, C_{1-4} linear or branched alkoxycarbonyl, phenyl-C_{1-4} alkoxycarbonyl, mono- or multi-phenyl-C_{1-4} alkoxycarbonyl, and when R_2 is a carboxylic metal salt, R_5 and X are not present simultaneously.

11. The compound according to claim 10, characterized in that R_2 is selected from the group consisting of hydrogen, carboxylic acid, carboxylic alkali metal salts, C_{1-2} alkoxycarbonyl, benzyloxycarbonyl, wherein the alkali metals refer to lithium, sodium, potassium, rubidium and cesium.

12. (Canceled)

13. The compound according to claim 12, characterized in that R_2 is hydrogen.

14. The compound according to claim 12, characterized in that R_2 is carboxylic acid.

15. The compound according to claim 12, characterized in that R_2 is sodium carboxylate.

16. The compound according to claim 12, characterized in that R_2 is ethoxycarbonyl.

17. The compound according to claim 1, characterized in that R_3 is selected from the group consisting of hydrogen, hydroxyl, C_{1-6} linear or branched alkoxy, C_{6-10} aryl-C_{1-6} linear or branched alkoxy, and heterocyclic oxy group.

18. The compound according to claim 17, characterized in that R_3 is selected from the group of hydrogen, hydroxyl, and C_{1-4} linear or branched alkoxy.

19. The compound according to claim 18, characterized in that R_3 is selected from the group consisting of hydrogen and C_{1-2} alkoxy.

20. The compound according to claim 19, characterized in that R_3 is hydrogen.

21. The compound according to claim 1, characterized in that R_4 is selected from the group consisting of hydrogen, C_{1-6} linear or branched alkyl, hydroxyl- C_{1-6} linear or branched alkyl, C_{6-10} aryl-C_{1-6} linear or branched alkyl, and mono- or multi-substituted C_{6-10} aryl-C_{1-6} linear or branched alkyl.

22. The compound according to claim 21, characterized in that R_4 is selected from the group consisting of hydrogen, C_{1-4} linear or branched alkyl, hydroxyl-C_{1-4} linear or branched alkyl, C_{6-10} aryl-C_{1-4} linear or branched alkyl, and mono- or multi-substituted C_{6-10} aryl-C_{1-4} linear or branched

alkyl.

23. The compound according to claim 22, characterized in that R_4 is selected from the group consisting of hydrogen, C_{1-4} linear or branched alkyl, hydroxyl-C_{1-2} alkyl, phenyl-C_{1-4} linear or branched alkyl, and mono- or multi-substituted phenyl-(C_{1-4}) linear or branched alkyl.

24. The compound according to claim 23, characterized in that R_4 is selected from the group consisting of hydrogen, C_{1-4} linear or branched alkyl, phenyl-C_{1-2} alkyl, and mono- or multi-substituted phenyl-C_{1-2} alkyl.

25. (Canceled)

26. The compound according to claim 25, characterized in that R_4 is butyl.

27. The compound according to claim 25, characterized in that R_4 is benzyl.

28. The compound according to claim 25, characterized in that R_4 is pentafluorobenzyl.

29. The compound according to claim 1, characterized in that R_5 is selected from the group consisting of hydrogen, linear or branched C_{1-6} alkyl, C_{6-10} aryl-C_{1-6} linear or branched alkyl, mono- or multi-substituted C_{6-10} aryl-C_{1-6} linear or branched alkyl, and heterocyclic ring; or R_5 is not present.

30. The compound according to claim 29, characterized in that R_5 is selected from the group consisting of hydrogen, linear or branched C_{1-4} alkyl, C_{6-10} aryl-C_{1-4} linear or branched alkyl, mono- or multi-substituted C_{6-10} aryl-C_{1-4} linear or branched alkyl, and heterocyclic ring; or R_5 is not present.

31. The compound according to claim 30, characterized in that R_5 is selected from the group consisting of hydrogen, linear or branched C_{2-3} alkyl, phenyl-C_{1-4} linear or branched alkyl, mono- or multi-substituted phenyl-C_{1-4} linear or branched alkyl; or R_5 is not present.

32. The compound according to claim 31, characterized in that R_5 is selected from the group consisting of hydrogen, phenyl-C_{1-2} alkyl, mono- or multi-substituted phenyl-C_{1-2} alkyl; or R_5 is not present.

33. The compound according to claim 32, characterized in that R_5 is selected from the group consisting of hydrogen, benzyl, mono- or multi-halogenated benzyl; or R_5 is not present.

34. (Canceled)

35. The compound according to claim 34, characterized in that R_5 is hydrogen.

36. The compound according to claim 34, characterized in that R_5 is benzyl.

37. The compound according to claim 1, characterized in that X is selected from the group consisting of halogen, nitroxyl, sulfuric acid group, sulfonic acid group, and phosphate group; or X is not present.

38. The compound according to claim 37, characterized in that X is halogen; or X is not present.

39. (Canceled)

40. The compound according to claim 38, characterized in that X is chloro.

41. The compound according to claim 38, characterized in that X is bromine.

42. The compound according to claim 38, characterized in that X is iodine.

43. The compound according to claim 1, characterized in that R_1 is selected from the group consisting of hydrogen, C_{1-6} linear or branched alkyl, C_{6-10} aryl-C_{0-6} linear or branched alkyl, mono- or multi-substituted C_{6-10} aryl-C_{0-6} linear or branched alkyl; R_2 is selected from the group consisting of hydrogen, carboxylic acid group, carboxylates, C_{1-6} linear or branched alkoxycarbonyl, C_{6-10} aryl-C_{1-6} linear or branched alkoxycarbonyl, mono- or multi- C_{6-10} aryl-C_{1-6} linear or branched alkoxycarbonyl; R_3 is selected from the group consisting of hydrogen, hydroxyl, C_{1-6} linear or branched alkoxy, C_{6-10} aryl-C_{1-6} linear or branched alkoxy; R_4 is selected from the group consisting of hydrogen, C_{1-6} linear or branched alkyl, hydroxyl- C_{1-6} linear or branched alkyl, C_{6-10} aryl-C_{1-6} linear or branched alkyl, and mono- or multi-substituted C_{6-10} aryl-C_{1-6} linear or branched alkyl; R_5 is selected from the group consisting of hydrogen, C_{1-6} linear or branched alkyl, C_{6-10} aryl-C_{1-6} linear or branched alkyl, mono- or multi-substituted C_{6-10} aryl-C_{1-6} linear or branched alkyl; X is selected from the group consisting of halogen, sulfonic acid group, sulfuric acid group, nitroxyl, and phosphate group; or R_5 and X do not co-exist simultaneously.

44. The compound according to claim 43, characterized in that R_1 is selected

from the group consisting of hydrogen, C_{1-4} linear or branched alkyl, C_{6-10} aryl-C_{0-4} linear or branched alkyl, mono- or multi-substituted C_{6-10} aryl-C_{0-4} linear or branched alkyl; R_2 is selected from the group consisting of hydrogen, carboxylic acid group, carboxylic alkali metal salts, C_{1-4} linear or branched alkoxycarbonyl, C_{6-10} aryl-C_{1-4} linear or branched alkoxycarbonyl, mono- or multi- C_{6-10} aryl-C_{1-4} linear or branched alkoxycarbonyl; R_3 is selected from the group consisting of hydrogen, hydroxyl, C_{1-4} linear or branched alkoxy; R_4 is selected from the group consisting of hydrogen, C_{1-4} linear or branched alkyl, hydroxyl- C_{1-4} linear or branched alkyl, C_{6-10} aryl-C_{1-4} linear or branched alkyl, and mono- or multi-substituted C_{6-10} aryl-C_{1-4} linear or branched alkyl; R_5 is selected from the group consisting of hydrogen, C_{1-4} linear or branched alkyl, C_{6-10} aryl-C_{1-4} linear or branched alkyl, mono- or multi-substituted C_{6-10} aryl-C_{1-4} linear or branched alkyl; X is selected from the group consisting of halogen, sulfuric acid group, sulfonic acid group, nitroxyl; or R_5 and X do not co-exist simultaneously.

45. The compound according to claim 44, characterized in that R_1 is selected from the group consisting of hydrogen, C_{1-2} alkyl, phenyl-C_{0-2} alkyl, mono- or multi-substituted phenyl-C_{0-2} alkyl; R_2 is selected from the group consisting of hydrogen, carboxylic acid group, carboxylic alkali metal salts, C_{1-2} alkoxycarbonyl; R_3 is selected from the group consisting of hydrogen, hydroxyl, and C_{1-2} alkoxy; R_4 is selected from the group consisting of hydrogen, C_{1-4} linear or branched alkyl, phenyl- C_{1-2} alkyl, and mono- or multi-substituted phenyl-C_{1-2} alkyl; R_5 is selected from the group consisting of hydrogen, C_{3-4} linear or branched alkyl, phenyl-C_{1-2} alkyl, mono- or multi-substituted phenyl-C_{1-2} alkyl; X is halogen; or R_5 and X do not co-exist simultaneously.

46. The compound according to claim 45, characterized in that R_1 is selected from the group consisting of hydrogen, methyl, phenyl, mono- or multi-substituted phenyl; R_2 is selected from the group consisting of hydrogen, carboxylic acid group, sodium or potassium carboxylate, and ethoxycarbonyl; R_3 is selected from the group consisting of hydrogen, hydroxyl, and C_{1-2} alkoxy; R_4 is selected from the group consisting of hydrogen, ethyl, butyl, benzyl, and pentafluorobenzyl; R_5 is selected from the group consisting of hydrogen, linear or branched butyl, benzyl, and pentafluorobenzyl; X is selected from the group consisting of chloro, bromine and iodine; or R_5 and X do not co-exist simultaneously.

47. The compound according to claim 46, wherein R_1 is hydrogen or methyl; R_2 is carboxylic acid group, sodium carboxylate, or ethoxycarbonyl; R_3 is hydrogen; R_4 is butyl or benzyl; R_5 is hydrogen or benzyl; X is chloro or bromine; or R_5 and X do not co-exist simultaneously.

48. The compound according to claim 1, wherein R_1 is hydrogen; R_2 is ethoxycarbonyl; R_3 is hydrogen; R_4 is benzyl; R_5 is hydrogen; and X is chloro.

49. The compound according to claim 1, wherein R_1 is hydrogen; R_2 is ethoxycarbonyl; R_3 is hydrogen; R_4 is benzyl; R_5 and X do not co-exist simultaneously.

50. The compound according to claim 1, wherein R_1 is methyl; R_2 is ethoxycarbonyl; R_3 is hydrogen; R_4 is pentafluorobenzyl; R_5 is hydrogen, and X is chloro.

51. The compound according to claim 1, wherein R_1 is methyl; R_2 is ethoxycarbonyl; R_3 is hydrogen; R_4 is pentafluorobenzyl; and X do not co-exist simultaneously.

52. The compound according to claim 1, wherein R_1 is hydrogen; R_2 is COOH; R_3 is hydrogen; R_4 is n-butyl; R_5 is hydrogen; and X is chloro.

53. The compound according to claim 1, wherein R_1 is hydrogen; R_2 is COOH; R_3 is hydrogen; R_4 is n-butyl; R_5 is hydrogen; and X do not co-exist simultaneously.

54. The compound according to claim 1, wherein R_1 is hydrogen; R_2 is COOM; R_3 is hydrogen; R_4 is n-butyl; R_5 is hydrogen; X do not co-exist simultaneously; wherein M is a metal.

55. (Canceled)

56. (Canceled)

57. The compound according to claim 55, wherein M is Na.

58. The compound according to claim 55, wherein M is K.

59. The compound according to claim 1, wherein R_1 is hydrogen, R_2 is ethoxycarbonyl, R_3 is hydrogen, R_4 is benzyl, R_5 is benzyl and X is bromine.

60. The compound according to claim 1, wherein R_1 is hydrogen, R_2 is hydrogen, R_3 is hydrogen, R_4 is benzyl, R_5 is benzyl and X is bromine.

61. The compound according to claim 1, which is selected from the group consisting of the following compounds or pharmacologically acceptable salts thereof:

9-Hydroxyethyl-7-methoxy-β-carboline;

9-Benzyl-7-methoxy-β-carboline;

9-(2',3',4',5',6'-Pentafluoro)benzyl-7-methoxy-β-carboline;

9-Phenypropyl-7-methoxy-β-carboline;

Ethyl 1-ethyl-β-carboline-3-carboxylate;

Ethyl 1-n-propyl-β-carboline-3-carboxylate;

Methyl 1-(4-hydroxyphenyl)-β-carboline-3-carboxylate;

3-Acetyloxomethyl-β-carboline;

Methyl 9-methyl-β-carboline-3-carboxylate;

Methyl 9-ethyl-β-carboline-3-carboxylate;

Methyl 9-butyl-β-carboline-3-carboxylate;

Methyl 9-benzyl-β-carboline-3- carboxylate;

Ethyl 9-ethyl-β-carboline-3-carboxylate;

Ethyl 9-butyl-β-carboline-3-carboxylate;

Ethyl 9-benzyl-β-carboline-3-carboxylate;

Ethyl 9-(2',3',4',5',6'-pentafluoro)benzyl-β-carboline-3-carboxylate;

Butyl 9-phenylpropyl-β-carboline-3-carboxylate;

Butyl 9-acetophenone-β-carboline-3-carboxylate;

Butyl 9-methyl-β-carboline-3-carboxylate;

Butyl 9-ethyl-β-carboline-3-carboxylate;

Butyl 9-benzyl-β-carboline-3-carboxylate;

Benzyl 9-benzyl-β-carboline-3-carboxylate;

9-Benzyl-3-hydroxymethyl-β-carboline;

9-Benzyl-3-acetyloxomethyl-β-carboline;

3-Carbohydrazide-9-ethyl-β-carboline;

3-Carbohydrazide-9-benzyl-β-carboline;

3-[(Methoxycarbonyl)amino]-9-ethyl-β-carboline;

3-[(Ethoxycarbonyl)amino]-9-ethyl-β-carboline;

3-[(Ethoxycarbonyl)amino]-9-benzyl-β-carboline;

Ethyl 9-ethyl-1-methyl-β-carboline-3-carboxyate;

Ethyl 9-butyl-1-methyl-β-carboline-3-carboxylate;

Ethyl 9-(2',3',4',5',6'-pentafluoro)benzyl-1-methyl-β-carboline-3-carboxylate;

Ethyl 9-phenylpropyl-1-methyl-β-carboline-3-carboxylate;

Ethyl 9-acetophenone-1-methyl-β-carboline-3-carboxylate;

Ethyl 1-propyl-9-methyl-β-carboline-3-carboxylate;

Ethyl 1-propyl-9-ethyl-β-carboline-3-carboxylate;

Ethyl 9-benzyl-1-propyl-β-carboline-3-carboxylate;

Ethyl 9-phenylpropyl-1-propyl-β-carboline-3-carboxylate;

Methyl 1-phenyl-9-methyl-β-carboline-3-carboxylate and

Methyl 1-phenyl-9-ethyl-β-carboline-3-carboxylate.

62. The compound according to claim 61, the pharmacologically acceptable

salt thereof being hydrochloride salt.

63. The compound according to claim 1, which is selected from the group consisting of the following compounds or pharmacologically acceptable carboxylates thereof:

9-Methyl-β-carboline-3-carboxylic acid;

9-Ethyl-β-carboline-3-carboxylic acid;

9-Butyl-β-carboline-3-carboxylic acid;

9-Benzyl-β-carboline-3-carboxylic acid;

9-(2',3',4',5',6'-Pentafluoro)benzyl-β-carboline-3-carboxylic acid;

9-Phenypropyl -β-carboline-3-carboxylic acid;

9-Acetophenone-β-carboline-3-carboxylic acid;

9-Methyl-1-methyl-β-carboline-3-carboxylic acid;

9-Ethyl-1-methyl-β-carboline-3-carboxylic acid;

9-Butyl-1-methyl-β-carboline-3-carboxylic acid;

9-Benzyl-1-methyl-β-carboline-3-carboxylic acid;

9-(2',3',4',5',6'-Pentafluoro)benzyl-1-methyl-β-carboline-3- carboxylic acid;

9-Phenylpropyl-1-methyl-β-carboline-3-carboxylic acid;

9-Acetophenone-1-methyl-β-carboline-3-carboxylic acid;

1-Propyl-9-methyl-β-carboline-3-carboxylic acid;

1-Propyl-9-ethyl-β-carboline-3-carboxylic acid;

9-Benzyl-1-propyl-β-carboline-3-carboxylic acid;

9-Phenylpropyl-1-propyl-β-carboline-3-carboxylic acid;

1-Phenyl-9-methyl-β-carboline-3-carboxylic acid and

1-Phenyl-9-ethyl-β-carboline-3-carboxylic acid.

64. The compound according to claim 63, wherein the carboxylate is a carboxylic metal salt.

65. (Canceled)

66. (Canceled)

67. The compound according to claim 65, wherein the alkali metal is Na.

68. The compound according to claim 65, wherein the alkali metal is K.

69. The compound according to claim 1, which is selected from the group consisting of the following compounds:

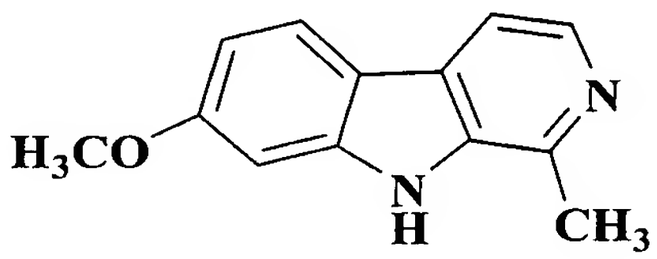
2,9-Dibenzyl-3-ethoxycarbonyl-β-carbolinium iodate;

2,9-Dimethyl-β-carbolinium iodate; and

2,9-Diethyl-β-carbolinium iodate;

70. A method for preparing the compound according to claim 1 comprising the following steps:

1) dissolving harmine (**1**) 1 into an organic solvent or a mixed organic solvent;



1

2) adding 60% NaH and stirring it until there is no bubble formed;

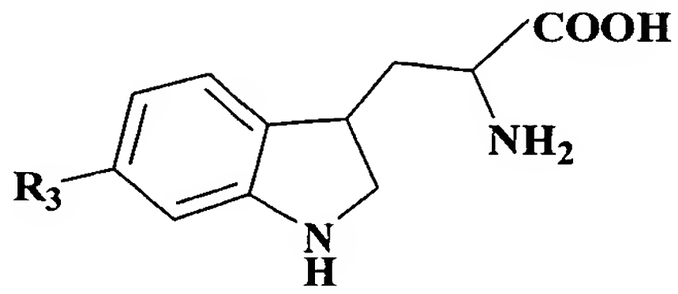
3) adding halogenated alkane;

4) stirring and reacting said mixture at room temperature for 1 to 5 h; and

5) subjecting said mixture to conventional post-treatment and purification to produce 1,7,9-trisubstituted β-carboline alkaloids.

71. A process for preparing the compound according to claim 1 comprising the following steps:

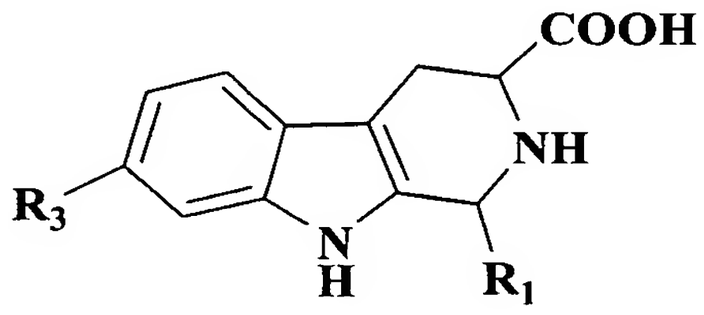
1) using a compound of formula II as the raw material;



(II)

wherein R_3 is as defined above;

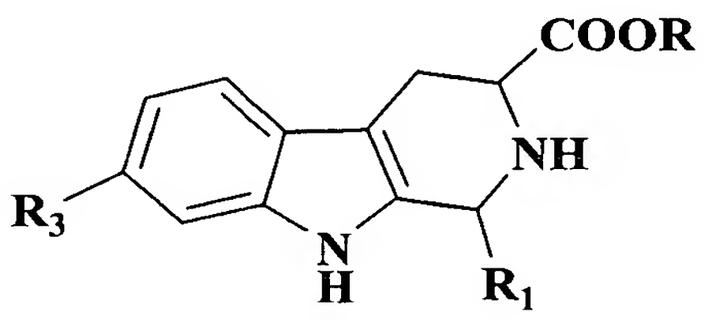
said compound is reacted with an aldehyde (R_1CHO) under the Pictet-Spengler condensation conditions of organic synthesis to form a compound of formula III;



(III)

wherein R_1 and R_3 are as defined above;

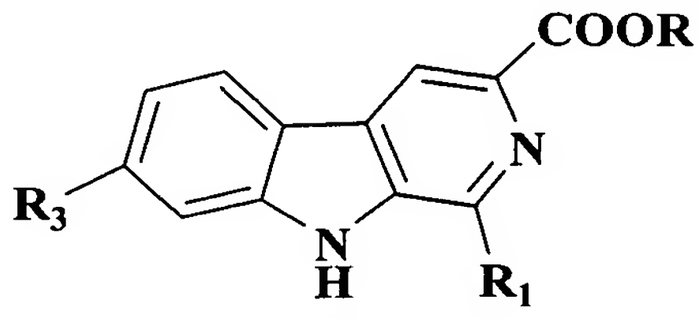
2) the compound of formula III is reacted with an alcohol under conventional esterification conditions of organic synthesis to form a compound of formula IV;



(IV)

wherein R_1 and R_3 are as defined above, and the definition of R is the same as R_1;

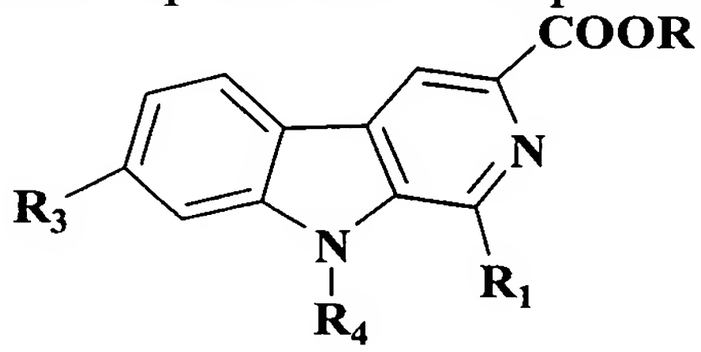
3) the compound of formula IV is reacted with a conventional oxidant under conventional oxidation conditions of organic synthesis to form a compound of formula V;



(V)

wherein R_1 and R_3 are as defined above, and the definition of R is the same as R_1;

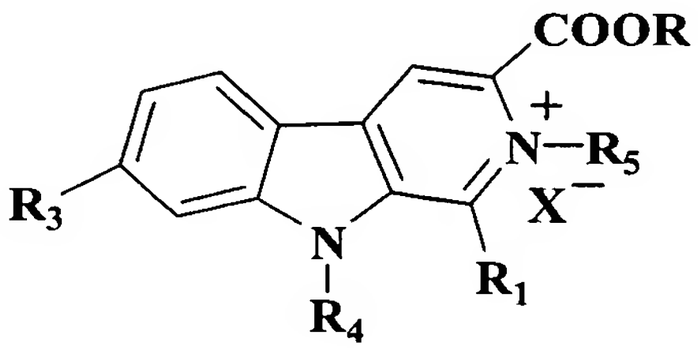
4) dissolving the compound of formula V in an organic solvent or a mixed organic solvent; adding NaH and stirring it until there is no bubble formed, adding halogenated alkane or aromatics; stirring and reacting said mixture at room temperature or by heating for 2 to 5 h; subjecting said mixture to conventional post-treatment to produce a compound of formula VI;



(VI)

wherein R_1, R_3 and R_4 are as defined above, and the definition of R is the same as R_1;

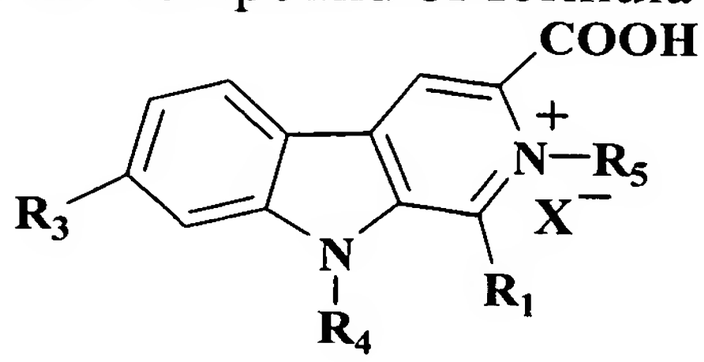
5) the compound of formula VI is reacted with an organic or inorganic acid under conventional salt-forming conditions of organic synthesis to form a compound of formula Ia, i.e. a specific example of the compound of formula I;



(Ia)

wherein R_1, R_3, R_4 R_5 and X are as defined above, and the definition of R is the same as R_1;

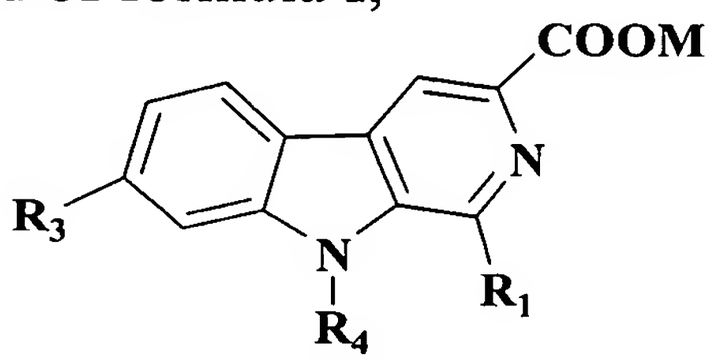
6) a hydrolysis reaction is conducted with the compound of formula VI under conventional hydrolysis conditions of organic synthesis followed by acidification by a conventional method to form a compound of formula Ib, i.e. a specific example of the compound of formula I;



(Ib)

wherein R_1, R_3, R_4 R_5 and X are as defined above, the definition of R is the same as R_1, or R_5 and X are absent simultaneously; and

7) a hydrolysis reaction is conducted with the compound of formula VI under conventional hydrolysis conditions of organic synthesis followed by acidification by a conventional method to form a compound having a free carboxylic acid group and then to form a compound of formula Ic by forming a salt with a base according to a conventional method, i.e. a specific example of the compound of formula I;

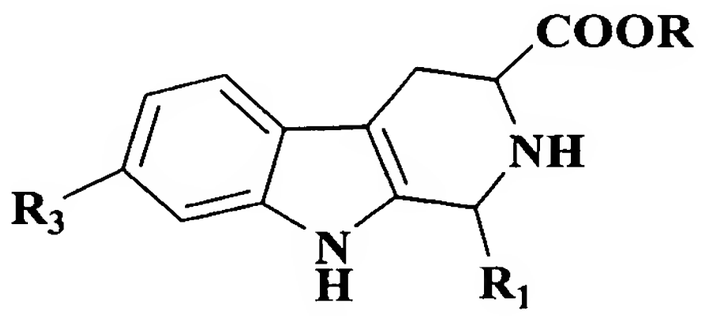


(Ic)

wherein R_1, R_3, and R_4 are as defined above, the definition of R is the same as R_1, and M represents an alkali metal.

72. A process for preparing the compound according to claim 1 comprising the following steps:

1) mixing a compound of formula IV with glacial acetic acid,

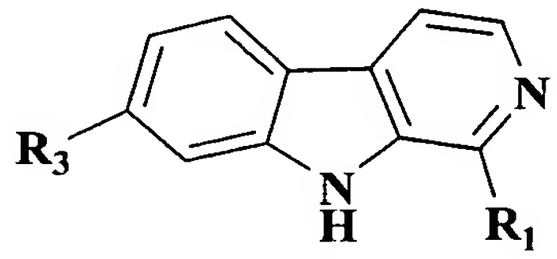


(IV)

2) adding selenium dioxide;

3) refluxing said mixture by heating for 12 h; and

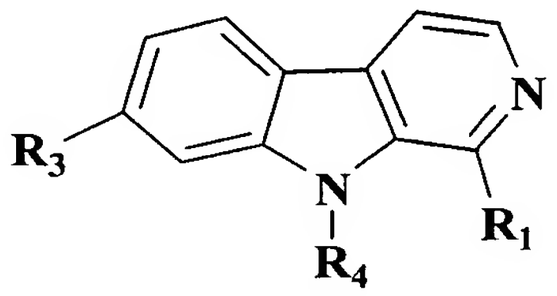
4) subjecting the mixture to conventional post-treatment and purification to produce a compound of formula VII



(VII)

wherein R_1 and R_3 are as defined above, and the definition of R is the same as R_1;

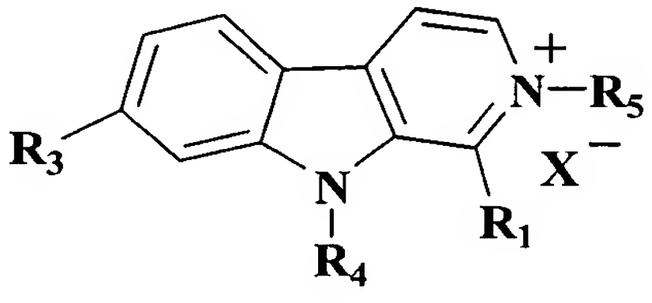
5) dissolving the compound of formula VII in an organic solvent or a mixed organic solvent;adding NaH and stirring it until there is no bubble formed, adding halogenated alkane or aromatics; stirring and reacting said mixture at room temperature or by heating for 2 to 5 h; subjecting said mixture to conventional post-treatment to produce a compound of formula VIII;



(VIII)

wherein R_1, R_3 and R_4 are as defined above, and the definition of R is the same as R_1;

6) the compound of formula VIII is reacted with an organic or inorganic acid under conventional salt-forming conditions of organic synthesis to form a compound of formula Id, i.e. a specific example of the compound of formula I;

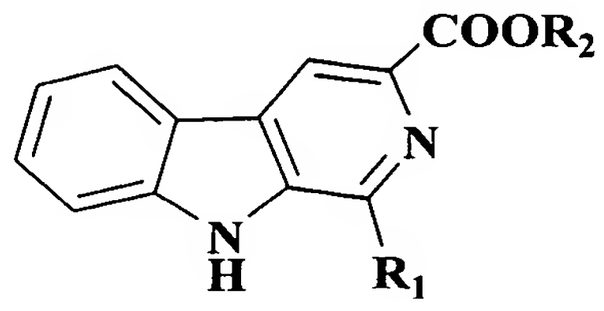


(Id)

wherein R_1, R_3, R_4 R_5 and X are as defined above, and the definition of R is the same as R_1.

73. A process for preparing the compound according to claim 1 comprising the following steps:

1) mixing a compound of the following formula with an organic solvent and 60% NaH;



wherein R_1=H and R_2=C_2H_5;
2) stirring and reacting said mixture at room temperature for 5 minutes;

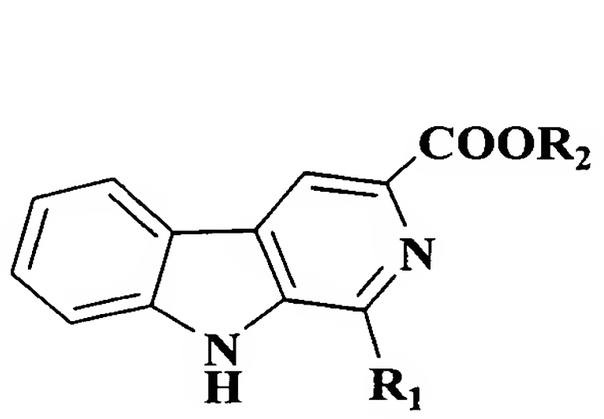
3) adding benzyl iodide;

4) stirring and reacting the mixture at a temperature of from 50 to 70□ for 2 h; and

5) subjecting the mixture to conventional post-treatment and purification to produce 2,9-dibenzyl-3-ethoxycarbonyl-β-carbolinium iodate.

74. A process for preparing the compound according to claim 1 comprising the following steps:

1) mixing a compound of the following formula with an organic solvent and 60% NaH;



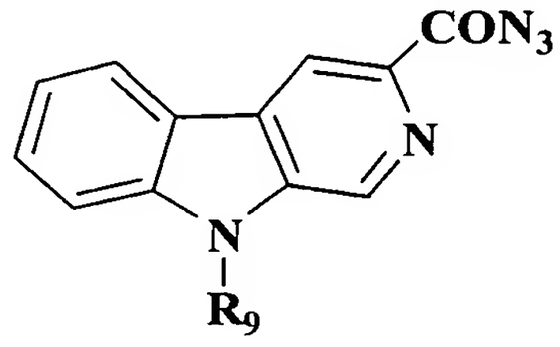
wherein R_1=H and R_2=C_2H_5;

2) adding benzyl bromide;

3) stirring and reacting said mixture at a temperature of from 50 to 70□ for 5 h; and

4) subjecting the mixture to conventional post-treatment and purification to produce 2,9-dibenzyl-3-ethoxycarbonyl-β-carbolinium bromate.

75. A compound of the following formula (53a-55a):



53a-55a

wherein

R_9 is methyl, ethyl, n-butyl, benzyl, phenylpropyl, mono- or polyhalogenated benzyl or mono- or polyhalogenated phenylpropyl.

76. (Currently amended) A pharmaceutical composition for treating tumors, comprising as an active ingredient at least one therapeutically effective amount of a compound of formula I according to [any one of claims] claim 1 [to 69], alone or combined with one or more pharmaceutically acceptable, inert and non-toxic excipients or carriers.

77. (Currently amended) Use of a compound of [any one of claims] claim 1 [to 69] in the manufacture of a medicament for treating tumors.

78. The use according to claim 77, wherein the tumors refer to alimentary tract tumors, including oral carcinoma, oesophagus cancer, gastric carcinoma, liver cancer and intestinal cancer tumors.

79. The use according to claim 77, wherein the tumors refer to the lung cancer tumors.

80. (Canceled)
81. (Canceled)
82. (Canceled)

83. The use according to claim 77, wherein the tumors refer to the cervical carcinoma tumors.

84. (Currently amended) The use of a compound of [any one of claims] claim 1 [to 69] in the manufacture of a medicament combined with phototherapy and radiation therapy for treating tumors.